



SAS[®] GLOBAL FORUM 2018

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The New Era of Credit Risk Modeling and Validation

Presenter

Boaz Galinson, V.P, Credit Risk Manager, Leumi Bank

- **Boaz Galinson** is Head of the Group Credit Risk Modeling and Measurement in the Risk Management Division at Bank Leumi.
- Mr. Galinson has 20 years of experience in risk management (Market Risk and Credit Risk) for Leumi and for the Supervision Unit of the Central Bank of Israel.
- Boaz speaks frequently at professional conferences and risk conferences and lectures in the Executive MBA programs (including Kellogg) in Tel -Aviv University.
- He holds MBA degree in Finance and B.Sc degree in Mathematics from TLV University, Israel.

The New Era of Credit Risk Modeling and Validation

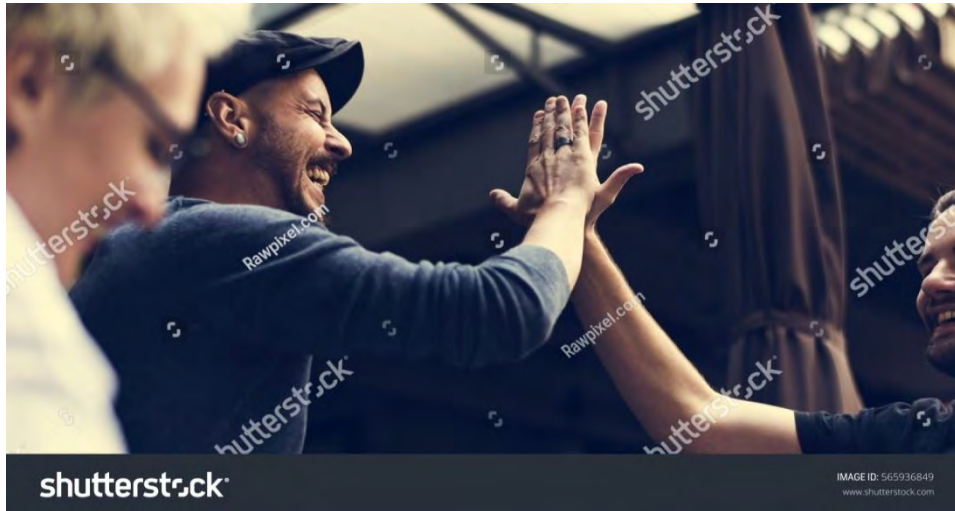
Boaz Galinson- V.P Credit Risk Manager

The New Era of Credit Risk Modeling and Validation

- * How to kick off ML models & “Big Data” in your organization?
- * What’s next in Credit Risk Modeling?
- * Traditional Modeling vs. Machine Learning Algorithms.
- * Building Intuition with ML Models- An Example.
- * Wrap up and Q&A.

How to kick off the new generation of models (ML, AI) and “Big Data” in your organizations ?

Step 1: Join Internal Successes & Allies



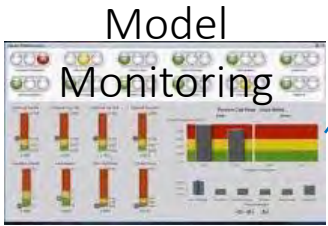
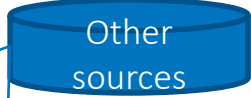
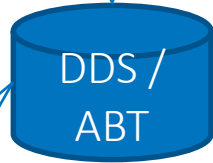
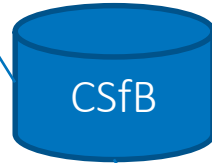
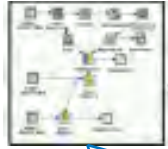
How to kick off the new generation of models (ML, AI) and “Big Data” in your organizations ?

Step 2: Ask for a Sand Box



Our Sand Box- SAS 9.4

Model Builder
(Miner, Guide, Studio)



SAS Enterprise Guide
SAS Enterprise Miner
SAS Studio

R Studio
Python
PySpark

SAS Connect to Hadoop

How to kick off the new generation of models (ML, AI) and “Big Data” in your organizations ?

Step 3: Set a Simple Work Plan

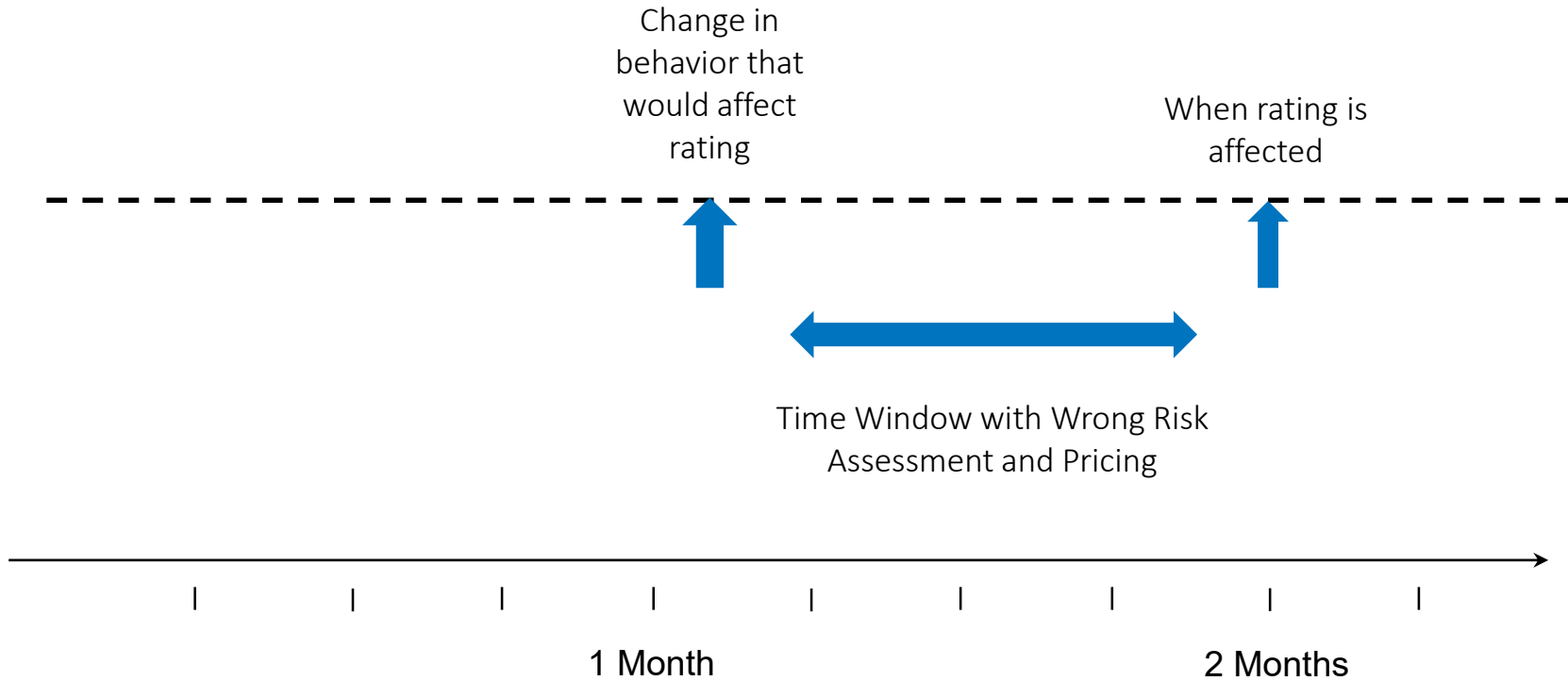


The New Era of Credit Risk Modeling and Validation

- * How to kick off ML and “Big Data” in your organization?
- * **What’s Next in Credit Risk Modeling?**
- * Traditional Modeling vs. Machine learning Algorithms.
- * Building Intuition with ML Models- An Example.
- * Wrap up and Q&A.

What's Next?

1. RTDM-Decisions based on models will be based on real time data.



What's Next?

2. ERM- ML and AI help integrating Credit Risk and Op. Risk

3. The role of models in our life will increase.

Building Eco Systems -Use of Big Data &IOT

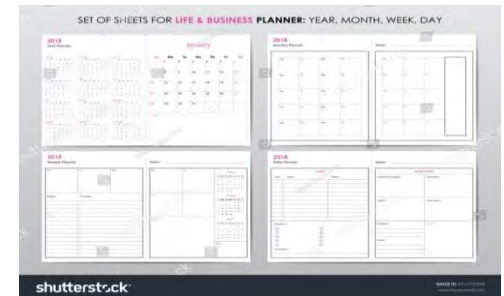
Transportation time



Autonomy car



Car Owner Availability



Garages Availability



- Repairs stock
- Technician



Predictive Maintenance

Maintain "Right"

- Personal
- Business
- Family
- Vacations/Holidays

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What's Next?

4. Models will include structured data and unstructured data.

Banking business model has already changed

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ML/AI

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“Machine learning gives computers the ability to learn without being explicitly programmed.”

Arthur Samuel

Traditional:

DATA

Algorithm/program ->output

ML/AI:

DATA

Output ->Algorithm/program

BIGDATA
Machine Learning Algorithms



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Typical Types of ML Models

1. **Regression** –most known and used
2. **Decision Trees** mixed with **Ensemble Methods** (Random Forest, Gradient Boosting Trees)
3. **Neural Network**
4. **Bayesian Network**
5. **Support Vector Machine**
6. **Nearest Neighbor**

How to pick the best model?

Problem: Each model might perform differently under different data set.

Solution (the market standard): Run all ,compare and choose the model, which performs the best.

Is that enough?

Is that Enough?

Building the Intuition-An Example

How well did the **Random Forest** compare to the Regression

| Model Type | Correlation between forecast (\hat{Y}_i) and real cost per unit (Y_i) |
|------------|---|
|------------|---|

a) Without U-shaped variable

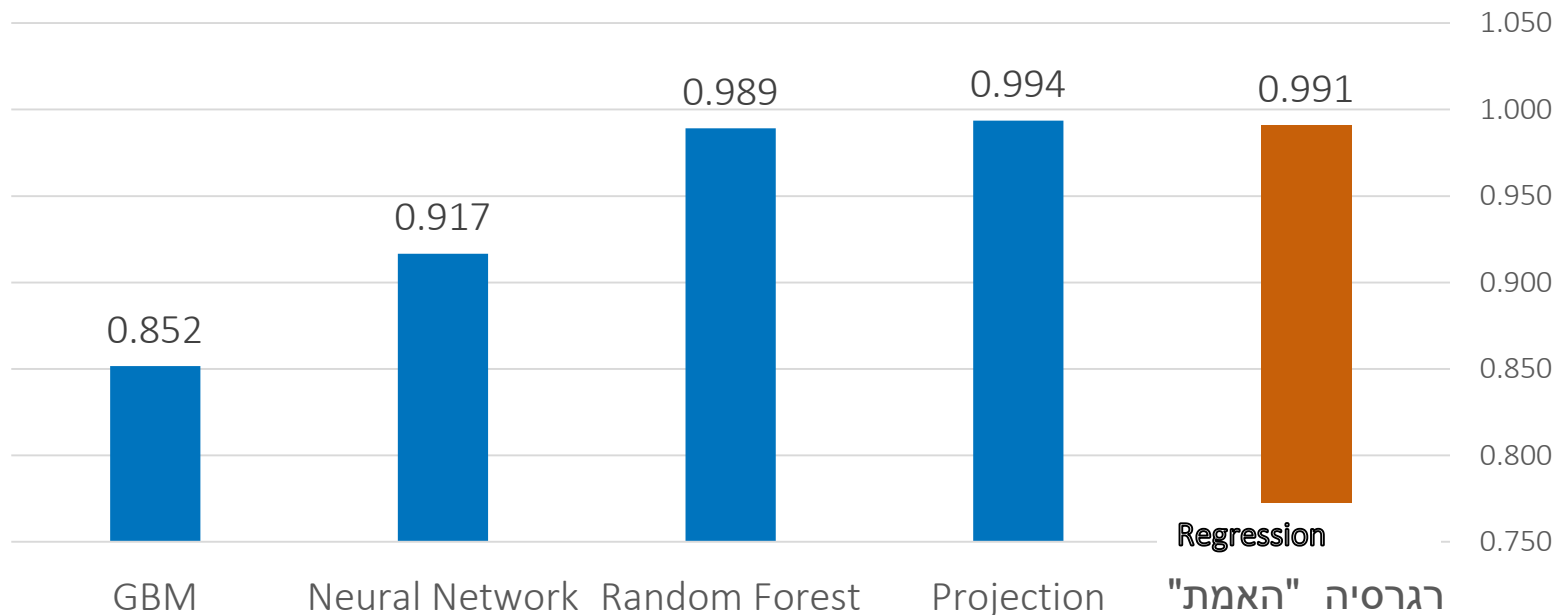
| | |
|---------------|---------------|
| Regression | 0.9711 |
| Random Forest | 0.9768 |

b) With U-Shaped variable

| | |
|---------------|---------------|
| Regression | 0.991 |
| Random Forest | 0.9755 |

How well did the other ML models compare to the Regression

With U-shaped variable



Wrap up

- The use of models will increase (Big Data, IOT).
- New types of algorithms (ML, AI) change the way we build, validate and deploy models (short SLA).
- Start your learning curve (internal successes, sand box, work plan).
- The best models still require business intuition. Current Data scientists are too technical and lack business intuition and statistical background.
- ML and Big Data are also relevant to Credit Risk modeling:
Real time Decision making & ERM.
- Advance tools for models (Dynamic ABT, Model Monitoring & Manager, RTDM, MRM, SAS VA, Connect to Hadoop) are essential to develop, validate, monitor, deploy models and reduce model risk.

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